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Evaluation of Nutritive, Antioxidant and Mineral Composition of *Pavetta indica* Linn. Leaves

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ABSTRACT

The leaves of *P. indica* were collected from Uttarakhand, India. The leaves of *P. indica* Linn. an important medicine of India, China and Lanka. Leaves of the plants are used for making important Ayurvedic drugs without isolation of target phytochemicals, hence different bio-chemical parameter viz; vitamin, carotenoid, carbohydrate, amino acid and minerals are play important role in human health. Macro minerals viz., Na, K, Ca and Li were estimated by AIMIL, Flame Photometer while micro elements viz., Fe, Cu, Mn, Zn and Co were estimated by Atomic Absorption Spectrophotometer, model 4129, Electronic Corporation of India Ltd. The leaves of plants are good source of antioxidants such as β-Carotene, Vitamin C and phenolics (0.27, 0.07 and 0.25%), respectively. The leaves have been found to rich in nutrients such as crude protein, carbohydrate and crude fiber (12.87, 13.36 and 39.94%), respectively and also in minerals such as Na, K, Ca, S, P, Fe, Mn, Cu and Zn (112.90, 8049.70, 231.02, 1975.00, 143.25, 74.93, 11.17, 2.27 and 2.67 mg 100 g), respectively. Results are suggest that leaves of *Pavetta indica* is a good source of nutrients, antioxidants and minerals and could be used as raw materials in drug formulation.

Key words: *Pavetta indica*, nutritive, antioxidant, mineral content

INTRODUCTION

Pavetta indica Linn. (Rubiaceae) is a stout bushy shrub, found in Shri Lanka, South China and Northern India. The leaves of plant are used in the treatment of liver dysfunction, pile, urinary diseases and fever (Kritikar and Busu, 1933; Thabrew *et al*., 1987). The roots of *Pavetta* are bitter, frequently prescribed in visceral obstructions. The roots of plant and dried ginger are given in conjunction with water in the case of dropsy of renal (Thabrew *et al*., 1987). Methanolic extract of leaves have been reported as antipyretic and anti-inflammatory (Mandal *et al*., 2003). The plant shoot and root biomass is used for the preparation of important crude drug like Ayur Breathe and Ayur Oil 31-Sarwavishadi Oil. Protein, essential amino acid, sugar, fat and essential minerals are responsible for nutritive value of plants. Unripe fruits of plants are used as vegetables or in pickles (Deshmukh and Shinde, 2010).

From animal tissue several workers have reported that the water soluble Vitamin C is an antioxidant synergist with the fat soluble Vitamin E and that both Vitamins can act together as powerful ant oxidative system in the cell (Hon-Wing *et al*., 1981). Vitamin C is known to be a potential antioxidant and it is essential for functioning of the central nervous system and help in fighting infectious diseases (Naik, 2003). Vitamin A and carotenoids can both accept and donate electrons and carotenoids can also quench singlet Oxygen (Devi and Rehman, 2002). β-Carotene

has been proved to prevent per oxidation caused by singlet oxygen and also by scavenging free radicals (Meydani *et al*., 1986; DiMascio *et al*., 1991). Flavonoids are the major class of phenolics and have been recognized for having a potential role in the prevention of several forms of cancer and cardiovascular diseases (Shetgiri and D'Mello, 2002).

The present study is mainly concerned on antioxidants, fat, protein, carbohydrate, fiber and minerals content in the leaves of *Pavetta indica* Linn. This is the first work concerned on analysis of antioxidants, biochemical and minerals in leaves of *Pavetta indica* Linn.

MATERIALS AND METHODS

Plants material: The leaves of the plant (5.0 kg) were collected in May 2006 from Thal (Disst. Pithoragarh, Uttarakhand) District identified by Prof. Y.P.S. Pangtey, Department of Botany, Kumaun University, Nainital and also from Dr. H.C. Pandey, Botanical Survey India, Dehradun. The voucher specimen was deposited in the Herbarium section at B.S.I., Dehradun (voucher No. 112174). The leaves were collected from 50 plants. The leaves were dried in shade after collection.

Biochemical analysis: The moisture content was estimated by dried in electrical oven at 80°C for 24 h and expressed on a percentage basis. The dried leafs were powdered separately in electric mill to 60 mesh size. The fine leaves powders so obtained were used for further biochemical and mineral analysis (three replication of each parameter). The carotenoids in plant sample were extracted, as described in Ranganna, (1976) and Witham *et al*. (1976) methods. The chlorophyll content in dry leaves powder was estimated by method (Singleton *et al*., 1999). Total phenolics content was estimated by method (Singleton *et al*., 1999) with modification. Dry leaves powder (0.5 g) was extracted with 10 time volume of 80% ethanol. The homogenate was centrifuged at 10,000 rpm for 20 min and the supernatant was collected. The residue was extracted three times with 80% ethanol, centrifuged and supernatant was collected. The supernatant was evaporated to dryness. The residue was dissolved in 5 mL double distilled water and 1.0 mL aliquots were added to 0.5 mL Folin-Ciocalteau reagent, followed by addition of 2.0 mL of 20% sodium carbonate solution and the absorbance measured at 650 nm. Tannins content was estimated as described by method (Schanderl, 1970). Ascorbic acid content was estimated by method (Ranganna, 1976) with modification. Dry leaves powder (2.0 g) was extracted with 4% oxalic acid and made up to 100 mL and centrifuged at 10,000 rpm for a 10 min. Five milliliter supernatant liquid was transferred in a conical flask, followed by addition of 10 mL 4% oxalic acid and titrated against standard dye solution (2.6 dichlorophenol-indophenol) to a pink end point. The procedure was repeated with a blank solution omitting the sample. Total carbohydrate content in plant leaves was estimated by the DuBois *et al*. (1956), Starch by Hodge and Hofreiter (1962). Total nitrogen was estimated by Micro-Kjeldahl method, according to AOAC (1985). Crude protein was calculated as Kjeldahl N x 6.25 (based on assumption that nitrogen constitutes 16.0% of a protein). The content of crude fat was estimated by AOAC (1970). Amylose content in plant leave was estimated, as described method (McCready *et al*., 1950; Juliano, 1971). Cellulose content was estimated as described by method (Updegraff, 1969). Crude fiber content was estimated as described by methods (Maynard, 1970).

Mineral analysis: Ash content was estimated by AOAC (1985) and ash insoluble content was estimated by Peach and Tracy, (1956) and Mishra (1968) method. Mineral content in plant was estimated by wet digestion method. 1.0 g plant material was first digested with conc. HNO_3 (5 mL

each), followed by application of 15 mL of tri-acid mixture (HNO_3, $HClO_4$ and H_2SO_4, 10:4:1, v/v) heated at 200°C and reduce to 1 mL. The residue after digestion was dissolved in double distilled water, filtered and diluted to 100 mL. This solution was used for the estimation of minerals. Macro minerals viz., Na, K, Ca and Li were estimated by AIMIL, Flame Photometer while micro elements viz. Fe, Cu, Mn, Zn and Co were estimated by Atomic Absorption Spectrophotometer, model 4129, Electronic Corporation of India Ltd. Phosphorous and sulpher content was estimated by method (Allen, 1977).

RESULTS AND DISCUSSION

Antioxidant content in *Pavetta* leaves is presented in Table 1. β-Carotene in *Pavetta* leaves was found to contain 277.64±0.88 mg/100 g on a dry weight basis with a range 276.98-278.88 mg/100 g. The content of Vitamin C in *Pavetta* leaves was found to be 77.49±1.83 mg/100 g on dry weight basis with a range of 74.90-78.90 mg/100 g.

The content of chlorophyll-a and chlorophyll-b in *Pavetta* leaves were found to be 91.88±0.63 and 64.50±0.54 mg/100 g on dry weight basis. The Phenolic and Tannins content in plant was found to be 251.52±0.34 and 2390.18±0.34 mg/100 g with a range of 250.23-252.68 for Phenolics and 2390.85-2391.65 mg/100 g for tannins.

Lipid, protein and total carbohydrate content in *Pavetta* leaves were found to be 2.82±0.07, 12.87±0.10 and 13.36±0.78 g/100 g, respectively on dry weight basis with a range of 2.75-2.92 for lipid, 12.86-12.87 for protein and 12.42-14.34 mg/100 g total carbohydrate, respectively. Starch, Amylose and Amylopectin content in *Pavetta* were found to be 17.19±1.30, 2.70±0.11 and 14.49±1.40 g/100 g, respectively (Table 2).

The cellulose, crude fiber and moisture content were found 3.90±0.33, 39.94±0.63 and 64.42±0.38 g/100 g respectively. The ash content was found 9.12±0.03 mg/100 g, on dry weight basis. Acid insoluble ash was found 1.46±0.27 g/100 g and acid soluble ash was found 7.66±0.27 g/100 g. The energy content of plant leaves was determined by multiplying the crude protein, crude lipid and total carbohydrate content by the factor 4, 9 and 4, respectively (Osborne and Voogt, 1978). Calorific values of the plant leaves were found 141 Kcal/100 g.

The mineral content of *Pavetta* leaves is presented in Table 3. The contents of Sodium, Potassium, Calcium and Lithium in *Pavetta* leaves were found 112.9±1.22, 8049.7±0.43, 231.88±0.67 and 54.6±0.87 mg/100 g, respectively on dry weight basis. Ranges were 111.68-114.56, 8049.20-8050.25, 231.02-232.66 and 53.95-55.84 mg/100 g of Na, K, Ca and Li, respectively.

The contents of Nitrogen, Phosphorus and Sulphur were found 2058.4±0.55, 143.25±1.07 and 1975.00±1.04 mg/100 g, respectively on dry weight basis. The contents of Iron, Copper, Manganese, Zinc and Cobalt in *Pavetta* leaves were found 74.93±0.69, 2.27±0.44, 11.17±0.80, 2.67±0.33 and 0 mg/100 g respectively on dry weight basis. The ranges were 74.06-75.76,1.92-2.80,10.05-11.80,

Table 1: Phytochemical composition of the leaves of *Pavetta indica* Linn.

Antioxidants	Composition (mg/100 g)
β-Carotene	277.64±0.88
Vitamin C	77.49±1.83
Chlorophyll-a	91.88±0.63
Chlorophyll-b	64.50±0.54
Phenolics	251.52±1.00
Tannins	2390.18±0.34

All values are mean of triplicate determinations expressed on dry weight basis. Values with ± denotes mean± SE

Table 2: Nutrients composition of *Pavetta indica* Linn. leaves

Biochemical parameter	Composition (g/100 g)
Moisture	64.42±0.38
Crude protein (Kjeldhal N x 6.25)	12.87±0.00
Crude Fat	2.82±0.07
Total carbohydrate	13.36±0.78
Starch	17.19±1.30
Amylose	2.70±0.11
Amylopectin	14.49±1.40
Cellulose	3.90±0.33
Crude fiber	39.94±0.63
Ash	9.12±0.03
Acid soluble ash	7.66±0.27
Acid insoluble ash	1.46±0.27
Calorific value (Kcal/100 g DM)	141.00

All values are mean of triplicate determinations expressed on dry weight basis. Values with ± denotes mean±SE

Table 3: Mineral composition of *Pavetta indica* Linn. leaves

Mineral	Composition (mg/100 g)
Sodium (Na)	112.9±1.22
Potassium (K)	8049.7±0.43
Calcium (Ca)	231.88±0.67
Lithium (Li)	54.60±0.87
Nitrogen (N)	2058.4±0.55
Phosphorus (P)	143.25±1.07
Sulphur (S)	1975.00±1.04
Iron (Fe)	74.93±0.69
Copper (Cu)	2.27±0.44
Manganese (Mn)	11.17±0.80
Zinc (Zn)	2.67±0.33
Cobalt (Co)	0.00

All values are mean of triplicate determinations expressed on dry weight basis. Values with ± denotes mean±SE

2.29-3.10 and 0.0 mg/100 g of Fe, Cu, Mn, Zn and Co, respectively. This is the first work on nutrients and minerals in *Pavetta indica* Linn., leaves, so we could not correlate above data with earlier workers data.

The minerals contained in this medicinal plant may play important role in human nutrition. Magnesium, calcium, and potassium in the human required for building red blood cell and for body mechanism (WHO, 1996). A deficiency of copper may cause hypertension, antibiotic sensitivity, hyperactivity, hyperglycemia, manic disorders, insomnia, allergies and osteoporosis (Watts, 1997). Calcium plays a major role in CNS function. Calcium is essential for nerve impulse conduction and activates some enzymes, which generate neurotransmitters (Watts, 1997). Phosphorous is tied to calcium is bone structure and plays a significant role in CNS function. Many enzymes contain as a base phosphoproteins. Phospholipids are involved in nerve conduction. Phosphate is the primary ion in extra and intracellular fluid. It aids absorption of dietary constituents, help to maintain the blood at a slightly alkaline level regulates enzyme activity and is involved in the transmission of nerve impulses (Karade *et al*., 2004). Potassium has many functions for protein synthesis, activation of many enzymes, stimulation of the movement of the intestinal tract etc., excess of

potassium can produce neurological disturbances such as numbness of hand and feet (Watts, 1997). Zinc is extremely important for numerous body functions. Zinc deficiencies are associated with mental impairments. Zinc deficiency may be associated with mental lethargy, emotional disorder and irritability (Watts, 1997). Iron plays significant role in oxygen transport in the body. Disturbance in mental function can be caused by flows in the metabolic pathways that require iron. This is because of too little oxygen reaching the brain. Iron required for DNA synthesis. Iron is also necessary for the activation of enzymes involved in brain neurotransmitters (Watts, 1997). Thus this plant could serve as good source of minerals when consumed. This conformed to the observation of some researchers who opened that green vegetables are good source of iron, copper and zinc (Barasi and Mottram, 1987).

We conclude that the plant leaves contain good amount of antioxidants, nutrients and minerals. The distribution of these components in common medicinal plants has important application for the health of people in addition to the basic need of developing countries. There is a great need to further research. Thus this plant could serve as good source of nutrients when consumed.

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